much more economical than the arrangement sometimes used to by-pass high-pressure steam to the intermediate valve chest in the case of triple-expansion engines, or to the low-pressure valve chests in the case of compound engines.

The weights consist of bell-crank levers which are pivoted in a casting firmly fixed to the governor spindle, thus rotating with it. The short end of the bell-crank lever engages with a sleeve which slides upon the spindle and rotates with it. Keys are not used, owing to the friction that would be caused. Stops are cast on the sleeve, upon which the weights rest under the tension of the springs when the engine is not running. At the end of the sleeve a circumferential groove is formed in which a split collar, usually of gun-metal, works, each half of the collar having a projection upon it which fits into a hole in the end of a forked bell crank lever, or there may be two levers. The spindle upon which the lever is mounted may be fixed in position by the centre-point bearings to reduce friction, the centre points being carried in a bracket, supported from the governor case. From the other end of the bell-crank lever a rod is led to the throttle valve, arranged if possible vertically above it, a direct connection being preferable in order to avoid a multiplicity of joints. Plain pin joints are used for the connections, and the surfaces should be ample, as although the force required to move the throttle valve is small, yet there is always a certain amount of vibration and movement in the governor, causing wear and ultimately leading to lost motion.

There are invariably two springs, one on each side of the governor weights, attached at each end to hooks or pins fixed in the weights, so that each spring takes half the centrifugal force. When making calculations it must be noted that the force generated in each weight forms the reaction to the force generated in the other weight, so that the springs may be calculated for the varying force in one weight only, bearing in mind at the same time that the total extension of the spring for that force is double that

given by the radial motion of one weight. It is as though each spring were cut in the middle, and each half-spring fixed to some part rotating with the governor, but that in manufacture the half-springs had been joined together to make one spring.

If it be imagined that the centre of gravity of the balls could be made to coincide with the axis, and that the springs were arranged in such a way that their pull on the balls in that position were zero, the combination in that form would be useless. With a given weight and strength of spring there would be a certain definite speed or angular velocity at which the balls could take any position, for the centrifugal force would vary with the radius, and so would the tension of the spring, and the slightest variation in speed in either direction would cause the governor to move to one or other extreme position. It would be impracticably sensitive. For stable governing it is necessary that a certain variation of speed be fixed upon, and that the strength or pull of the sprirfgs should increase more rapidly than the centrifugal force of the balls as they move outwards, *assuming the*